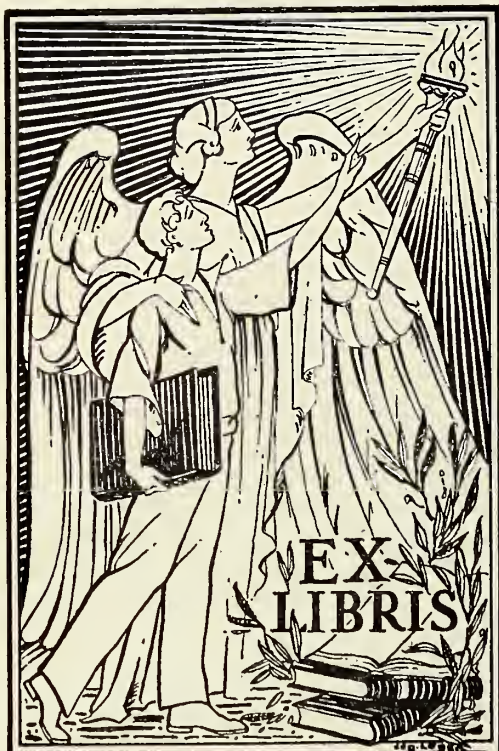


VISIBLE SPEECH FORMULA
FOR BRAILLE
by
Anthony S. Henry, O.S.A.

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HY/669



AMERICAN FOUNDATION
FOR THE BLIND INC.

Explanatory matter -withdrawn
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VISIBLE SPEECH FORMULA FOR BRAILLE

The invention of sonography by the French army officer, Charles Barbier, was described in its day as "a process which makes possible communication between the deaf and the blind." From this phonetic code of dots and dashes on embossed paper, a 15-year-old blind boy developed an entirely new and much more legible set of orthographic ciphers, destined to perpetuate the memory of his name.

The only importance now attributed to Barbier's code is the fact that it was tested at the Royal Institution for the Young Blind, in Paris, during the early days of Louis Braille's residence there. Little did the artillery captain surmise how significant for future generations of sightless persons was his stubborn insistence that the instructors at the school listen to his proposals and consider the possibilities of his method of embossing symbols of sound on paper. Little did M'sieur le capitaine foresee that a talented little teen-ager was to conceive and to construct a system of communication bound to outshine anything yet achieved for the blind in the history of the world.

In retrospect, we are gratified to note that both Charles Barbier and Louis Braille had their services to society formally recognized by the French Academy of Sciences more than a hundred years ago.

During the past century the education of the blind has forged ahead by leaps and bounds, largely because of the invention of the braille system of writing. The past 25 years was especially productive of uniformity of coding among various sections of linguistic areas. During the past five years much has been accomplished in the standardization of symbols for similar sounds or letters in as many languages as possible.

At the present time the United Nations Educational, Scientific and Cultural Organisation is ready to publish an exhaustive reference book on the histories and principles of all known braille systems, along with an account of Unesco's own part in promoting the adoption of necessary international standards for world braille.

Educators of the blind are well aware that braille is quite cumbersome, complex, and inconvenient. Yet, in spite of these admissions by expert braillists, it is noteworthy that every attempt to improve the braille coding system has finally wound up by returning to the original alphabet. This seems to have been the best solution to the problem, under the circumstances, since those who organized these efforts to simplify the code pledged themselves in advance to retain the seven-line symmetry of Louis Braille's alphabet.

If we were to consider the construction of an international braille code having horizontal as well as vertical symmetry, we might not be too sure that the ten fundamental signs of the original alphabet constitute the best possible basis of a symmetry pattern. Now, although there are any number of ways in which the 63 symbols can be arranged and designated, there would be no advantage in switching to a new set of values unless such a proposed code promises to syncretize the inter-relation of the letter symbols with the sounds they most frequently represent.

Recently, while experimenting with a "phonetic-sequence-formula" which I had constructed, I found that when applied to the braille dot-combinations a pattern of perfect co-ordination among all relatives in the speech charts results. This means that a re-allocation of interpretations of the various cells (according to the braille code which I have worked out) gives us a fundamentally simple code with no confusion whatever to any transcriber or reader. It eliminates multiple connotations of each of the symbols and still allows for limitless contractions. Furthermore, the new symmetry design allows for number-digit-dots which do not conflict with the letter forms.

INTRODUCTION

Seven years ago I had the happiness of being ordained to the holy priesthood in the Cathedral of Milwaukee. A few weeks prior to ordination our class of seminarians had been treated to a guided tour of the classrooms of St. John's School for the Deaf in that city. The tour was conducted by the chaplain, Father Gehl. Demonstration of the techniques of instruction was provided by the various Sisters with their pupils. Although that experience took place in 1946, the impressions it left with me are still quite profound.

Unfortunately I am unskilled in linguistics and semantics. Yet I do possess an appreciation of the value of phonetics in speech training. It has been my conviction for some time that it must be possible to compile a phonetic index of the words of our language so that the listings would be based upon a pre-arranged sequence of the sounds rather than of the spelling by letters. If this sequence of the phonetic elements is founded on scientific observations it should not be difficult to organize the tabulations so that every word which appears alike in visible speech¹ would be grouped together in the index.

The witnessing of modern methods of instructing deaf children to speak prompted me to search out ways of accelerating the preparation of a phonetic "sequence formula" which would be of practical value. It is almost three years now since I

1-Visible speech is a phonetic translation of audible speech. The art of lip reading, an important channel of communication for the deaf, depends for its visible speech patterns on the observable movements of the speech organs in conversation. Technicians at the Bell Telephone Laboratories use the term "visible speech" in connection with portrayal by pictures of the impression made by speech sounds recorded on magnetic tape. Messages intended for aural perception are converted into a form suitable for visual perception by means of visible speech translators. See Bell Monograph B-141/5, pp. 62-73.

B-1415

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began attempting to construct a series of the standard phonetic characters in such a manner that the inter-relation of the speech sounds in this series would provide the key to an ideal phonetic index in any language employing these sounds.

My attendance at the 1952 summer meetings of the Volta Speech Association for the Deaf¹ left me convinced that my proposed project would be well worth the effort involved in its production. At this convention² there were teachers representing a very high percentage of the major schools for the deaf in North America. The demonstrations of techniques (using actual deaf children) was a wonder to behold.

More than a year ago I determined the order of the consonants as I then envisioned what I was aiming to achieve, but the vowels, semi-vowels and semi-consonants were the source of so much uncertainty that for a long time I wondered whether I would ever unravel the mystery. It is only now that I am able to announce that I have at last completed the table of sequence which I sought to construct. It was finished by Thanksgiving Day, 1953, and for me it was the crowning reward of countless unsuccessful attempts to organize the speech elements in a satisfactory sequence "from a to z."

Phoneticians may be surprised to hear that a brief introduction to the technique of transcribing braille for the blind was instrumental in providing me with a clue enabling me to determine the exact order to be observed among the non-consonant factors in this quest for a reliable sequence of speech sounds.

1-On June 5, 1953, this name was officially changed to include its founder's name. It is now known as the Alexander Graham Bell Speech Association for the Deaf. The Association was founded in 1890 by the inventor of the telephone. Bell, incidentally, was the son and grandson of renowned Edinburgh phoneticians. He himself opened a school for training teachers of speech to the deaf in 1870 at Boston.

2-The theme of this 62nd annual summer convention was: "That the Deaf May Speak." Sponsors were the Clarke School for the Deaf, Northampton, Mass., and the Horace Mann School for the Deaf, Roxbury, Mass. I was present at the Boston meetings only.

Although there is still much which I don't know about braille, I blithely believe that I have managed to evolve a rather unique method of coding visible speech for finger reading. Louis Braille's original symbols are given revised interpretations in this system of braille notation. These new allocations permit our braille phonetic version of recorded messages to portray a tactile picture-analysis of the visible speech pattern. The purpose of this paper is to publicize the underlying principles of this proposed phonetic² and numerical code.

When it became evident to me that the braille combinations³ blended very harmoniously with the phonetics formula which I had devised, I tried to discover how those concerned with instructing the blind might react to any suggestion pertaining to possible clarification of the braille code. Being advised that the American Joint Uniform Braille Committee would be interested in making a study of these proposals, I offer them in the following pages of this paper.

For those who are unacquainted with the speech symbols of the International Phonetics Association I strongly recommend consulting the new and completely revised (1952) edition of Margaret Prendergast McLean's, Good American Speech. It is published by E.P. Dutton and Company, New York. For technical data on visible speech experiments, see Potter, Kopp & Green, Visible Speech, and Harvey Fletcher, Speech and Hearing in Communication (D. Van Nostrand Company, Inc., New York.)

- 1-Common characteristics of related speech sounds are manifest by similar dot formations. The basic phonetic principles of visible speech are closely integrated with physiological phonetics. (B-1415, pp. 74-89).
- 2-Sir Clutha Mackenzie, one of the world's outstanding blind men, and an authority on braille codes, has long advocated the principle of sound in the transcription of braille. Cf. Outlook for the Blind, 1946, pp. 227-229, & 256-259.
- 3-The braille cell contains 6 units of points or dots. Speech engineers consider as ideal the set-up of a language which is communicable through a simple system of only 6 elements.

mation of dots in each vertical column constitute the symbols with call numbers divisible by 9. They form a diagonal from the top left corner to the lower right. The other diagonal consists of the multiples of 7. If you were to crease the 8-line symmetry pattern diagram along the diagonal running from zero to symbol #63, so that symbol #7 overlaps symbol #56, all reverse combinations will be found to coincide.

Now we shall explain the technique employed in giving new interpretations to the symbols.

Distribution of the 63 braille combinations:

46 phonetic symbols

1-dot cells.... 6

2-dot "13

3-dot "16

4-dot " 8

5-dot " 3

Total: 46

10 number digits

7 punctuation signs (in phonetic code)

(In our orthographic code,
(where correct spelling is
(essential, 26 letter signs
(are required. 25 of these
(are the same as their pho-
(netic equivalents and one
(is taken from the punctu-
(ation code.)

63

PHONETICS IN BRAILLE - The braille units conform rather neatly with the vowel and consonant speech charts for linguistic elements of the Western world. Each of the main speech sounds is symbolized in our code by one particular cell combination and no other, so that a sightless person knowing this code, should have no difficulty in approximating the verbal interpretation of the words represented --even though he has never heard them pronounced. The compiler of the code believes that his product also supplies a visible speech pattern useful especially to the deaf-blind. The same would apply to the sighted totally deaf who have a knowledge of this "brand" of braille.

Without exception, each speech sound is classified in a category easily identifiable by the number of dots in its construction. The vowels fit snugly into special categories. Definite distinguishing features mark all consonants possessing similarities. For example, each pair of voiced and voiceless cognates consist of reverse combinations.

Classifying the Speech Sounds:

- (1) The 5 fundamental Latin vowels are represented by a single dot. The 6th dot functions as a vowel modifier (& the schwa).
- (2) All other vowel sounds have 2 dots.
- (3) The transitionals (semi-vowels and semi-consonants) and the non-fricative consonants each engage 3 dots.
- (4) The fricative consonants comprise 4 dots each.
- (5) The affricates are made up of 5-dot combinations.

In the following charts the phonetic symbols of the International Phonetics Association are employed to indicate dot positions and sounds represented.

Key to Vowel Code:

i	e
e	u
a	o

I- The one-dot cells

i	e			u	
a				o	

The 5 fundamental Latin vowels and the schwa. The schwa is an unstressed vowel-sound when not connected with another vowel.

II- The two-dot cells

e	e	iə	e	e
a	e		o	u
(ʌ)	(ɛ)	(ɪ)	(ɔ)	(ʊ)

Modified vowels

The short vowels, hybrid vowels and rising diphthongs.

e	e	u
a	o	
(æ)	(œ)	(y)

Hybrid vowels - These are crosses between two pure vowels. We form them by employing both sounds concerned.

i	i	i	u	u
a	e	o	o	a
(ai)	(ēi)	(ɔi)	(ū)	(āu)

Rising Diphthongs - result of an elision between two of the fundamental vowels as shown.

NOTE: The IPA symbol (ɜ:), peculiar in many ways, can be represented, for all practical purposes, by the symbol for the hybrid vowel (œ) - which is foreign to English.

COMPOUND CELLS - The French nasal vowels may be formed by two successive vowel signs, the first being the modifier and the other: the nasalized vowel.

The so-called falling diphthongs are the result of a glide from a vowel to a semi-vocalic "r-color" sound. Since they actually consist of two successive vowel sounds interrupted by a kind of constriction, we thought of designating them by two successive cell formations, namely

1) the vowel concerned, and 2) the modifier.

The "a" sound in such words as "ask" and "after" may always be correctly spoken as "α"- but in large areas it is preferable to voice it as "a." It is represented in our system by the addition of the vowel modifier in a cell following the vowel in symbol #1. (In languages not employing our vowel in symbol #33, there would be no need of this compound cell distinction.) See latest revisions of IPA for the new symbol (a). → = [ʌ]

III- The three-dot cells - - - The transitionals. These comprise the semi-vowels r, j, and w, and the aspirated semi-consonants Ṁ, ḥ, and ḵ. Thus:

o.	o	o.	o	o	o.
o.	o	o.	o	oo	oo
o.	o	o.	o.	o.	o.
(r)	(j)	(w)	(Ṁ)	(ḥ)	(ḵ)

The non-fricative consonants also have a total of 3 dots each, one of these being on one side and two on the other. The voiceless cognate is identified by the top dot on the left side. Its vibrated counterpart is the reverse in braille print. The nasal consonants have the same left-column composition as the vibrated cognate, but each nasal employs the middle right dot as a distinguishing mark. The only lateral consonant in this code, the sound (l), is the reverse combination of braille symbol (n).

VOICELESS		VOICED		
o.	o	o.	oo	
(k) o.	(g) o.	o. (ŋ)		Soft palate
oo	oo	o.	o	
(t) o.	(d) o.	o. (n)	o. (l)	Alveolar (gum ridge)
oo	oo	o.		
(p) o.	(b) o.	oo		Bi-labial
		.. (m)		
		Nasal	Lateral	

The so-called falling diphthongs and the rising
 glide from a vowel to a semi-vowel. The former
 group, which they actually form, is of the nature
 of a vowel, and is distinguished by a kind of continuous
 motion, we should say, of the articulating organ, from the
 latter, which is of the nature of a consonant.

The first of these is the diphthong *ai*, which is
 formed by the union of the vowel *a* and the semi-vowel *i*.
 It is distinguished from the latter by the fact that
 the articulating organ is in a different position at the
 beginning and end of the sound. In the case of the
 latter, the articulating organ is in the same position
 throughout the sound. The diphthong *ai* is
 distinguished from the latter by the fact that the
 articulating organ is in a different position at the
 beginning and end of the sound. In the case of the
 latter, the articulating organ is in the same position
 throughout the sound.

The second of these is the diphthong *au*, which is
 formed by the union of the vowel *a* and the semi-vowel *u*.
 It is distinguished from the latter by the fact that
 the articulating organ is in a different position at the
 beginning and end of the sound. In the case of the
 latter, the articulating organ is in the same position
 throughout the sound. The diphthong *au* is
 distinguished from the latter by the fact that the
 articulating organ is in a different position at the
 beginning and end of the sound.

The third of these is the diphthong *oi*, which is
 formed by the union of the vowel *o* and the semi-vowel *i*.
 It is distinguished from the latter by the fact that
 the articulating organ is in a different position at the
 beginning and end of the sound. In the case of the
 latter, the articulating organ is in the same position
 throughout the sound. The diphthong *oi* is
 distinguished from the latter by the fact that the
 articulating organ is in a different position at the
 beginning and end of the sound.

The fourth of these is the diphthong *ou*, which is
 formed by the union of the vowel *o* and the semi-vowel *u*.
 It is distinguished from the latter by the fact that
 the articulating organ is in a different position at the
 beginning and end of the sound. In the case of the
 latter, the articulating organ is in the same position
 throughout the sound. The diphthong *ou* is
 distinguished from the latter by the fact that the
 articulating organ is in a different position at the
 beginning and end of the sound.

The fifth of these is the diphthong *ei*, which is
 formed by the union of the vowel *e* and the semi-vowel *i*.
 It is distinguished from the latter by the fact that
 the articulating organ is in a different position at the
 beginning and end of the sound. In the case of the
 latter, the articulating organ is in the same position
 throughout the sound. The diphthong *ei* is
 distinguished from the latter by the fact that the
 articulating organ is in a different position at the
 beginning and end of the sound.

The sixth of these is the diphthong *eu*, which is
 formed by the union of the vowel *e* and the semi-vowel *u*.
 It is distinguished from the latter by the fact that
 the articulating organ is in a different position at the
 beginning and end of the sound. In the case of the
 latter, the articulating organ is in the same position
 throughout the sound. The diphthong *eu* is
 distinguished from the latter by the fact that the
 articulating organ is in a different position at the
 beginning and end of the sound.

IV. The four-dot cells - - - The fricatives. These may be either dental or sibilant (hissing). All dentals have 2 upper dots together on one side. Again the voiceless symbol is the reverse of *its* vibrated cognate. The sibilants have 3 of the 4 dots on one side:

DENTAL		SIBILANT	
•	*	**	**
**	**	*	*
*	*	*	*
f	v	ɸ	ʒ
**	**	*	*
*	*	**	**
* θ	* ʒ	*	*
		s	z

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V- The five-dot cells - - - The affricates which are common to IPA and Esperanto. Each of these "meshed" sounds contains a sibilant and hence can readily be recognized by the full column of 3 dots on one side :

中中	中中	中
中中	中中	中中
中	中	中中
ts	dz	ts

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 104

ANOTHER BRAILLE ALPHABET ? - To suggest drastic revisions in the present braille alphabet, is perhaps unwise. Experience has proven that there is bound to be much opposition against any radical changes in the existing set-up. Notwithstanding that fact, the compiler of the foregoing braille phonetic code can hardly refrain from indicating how this phonetic code is conveniently convertible to our 26-letter alphabet for braille writing according to spelling.

It is, of course, up to the authorities concerned with braille to decide whether our technique of transcribing in braille deserves encouraging. It is the author's contention that his code lessens the labor required of would-be transcribers and readers in mastering the multiple connotations and combinations of ciphers in the current code.

1. The first of these is the fact that the
2. second is the fact that the
3. third is the fact that the
4. fourth is the fact that the
5. fifth is the fact that the
6. sixth is the fact that the
7. seventh is the fact that the
8. eighth is the fact that the
9. ninth is the fact that the
10. tenth is the fact that the

1900

Henry's Proposed Braille Numeric Code:-

Key:

2 8
4 1

Digit
values
of
Upper
case
dots.

⠇	⠇	⠇	⠇	⠇
⠏⠇⠏	⠏⠇⠏	⠏⠇⠏	⠏⠇⠏	⠏⠇⠏
0	2	4	6	8

⠇	⠇	⠇	⠇	⠇
⠏⠇⠏	⠏⠇⠏	⠏⠇⠏	⠏⠇⠏	⠏⠇⠏
1	3	5	7	9

Each odd number comprises preceding numeral plus the 1-dot.

— 7

— 7

)
)



Blueprint of 8-line symmetry plan for coding visible speech and numeric symbols in braille.

VISIBLE SPEECH FORMULA FOR BRAILLE

A Braille Coding Technique based on a vertical and horizontal symmetrical pattern of the conventional symbols. This outline includes a proposed numeric and phonetic code adaptable for international use. Suggestions for an orthographic and a punctuation code are also enclosed.

It is the compiler's belief that this plan conforms with requirements recommended in the definition of world braille as drafted at the UNESCO World Braille Conference held in March, 1950.

* * * * *

This is a copy of the original report issued the 6th of January, 1954, and respectfully submitted to THE AMERICAN JOINT UNIFORM BRAILLE COMMITTEE for their appraisal.

The immeasurable energy entailed in "hatching" it is joyfully dedicated to the blind, the deaf, their guardian-angel instructors and braille transcribers everywhere.

---Anthony S. Henry, O.S.A.,
3103 Arlington Ave.,
New York 63, N. Y.

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The article which follows was completed on December 8, 1953, and ready for release at that time. Prior to publication I have contacted several addresses of organizations and institutions better versed on braille matters than I am. In these contacts I have mentioned my conviction that I had evolved a method for coding in braille which seems to possess distinct advantages over the conventional system. I requested references and any sort of information which would enable me to discern the desirability of braille authorities for any such suggestions as disclosed herein. I am happy to say that the response from every direction was exhilarating. It is, therefore, for me a genuine pleasure to make public these findings on the 102nd anniversary of Louis Braille's transition from this vale of darkness to the everlasting clear vision of his Creator, face to face.

Let it be known that the author of this braille coding system has no desire to promote its adoption unless it be sanctioned by the proper authorities. Rightly, he feels that it is the business of braille experts to scrutinize it from their practical and collective viewpoint, to test it -- if they think it feasible to do so, in order that a competent conclusion may be reached as to any merits the scheme may possess. Sometimes it happens that plans look practicable on paper, but they just won't work out -- as, for instance, the sonographic "night writing" of Barbier.

If this sincere effort to contribute in some way toward the alleviation of the situation of the sightless does no more than give someone else a clue to a better idea yet, then its publication has served a good and useful purpose.

Comments you may wish to make concerning this proposed formula for brailling visible speech in phonetic symbols and numbers in mathematical symbols should not be addressed to the author, for he is only a novice at braille. Please channel your reactions to the enclosed "formulae" to recognized representatives engaged in the wonderful work of instructing the blind.

ANTHONY S. HENRY, O.S.A.
January 6, 1954

THEORY OF THE EARTH AND ITS HISTORY

The first part of the book is devoted to a general survey of the history of the earth, from the beginning of time to the present day. It is divided into three main periods: the prehistoric, the historic, and the modern. The prehistoric period is further divided into the stone, bronze, and iron ages. The historic period is divided into the ancient, the middle, and the modern ages. The modern period is divided into the 17th, 18th, and 19th centuries. The book is written in a clear and concise style, and is suitable for use as a text-book in schools and colleges.



The second part of the book is devoted to a detailed account of the geology of the earth. It is divided into two main parts: the physical geology and the historical geology. The physical geology is divided into the study of the rocks, the minerals, and the fossils. The historical geology is divided into the study of the changes in the position of the continents, the mountains, and the seas. The book is written in a clear and concise style, and is suitable for use as a text-book in schools and colleges.

The third part of the book is devoted to a detailed account of the climate of the earth. It is divided into two main parts: the physical climate and the historical climate. The physical climate is divided into the study of the temperature, the humidity, and the wind. The historical climate is divided into the study of the changes in the climate of the earth from the beginning of time to the present day. The book is written in a clear and concise style, and is suitable for use as a text-book in schools and colleges.

The fourth part of the book is devoted to a detailed account of the life of the earth. It is divided into two main parts: the physical life and the historical life. The physical life is divided into the study of the plants, the animals, and the human beings. The historical life is divided into the study of the changes in the life of the earth from the beginning of time to the present day. The book is written in a clear and concise style, and is suitable for use as a text-book in schools and colleges.



CLASSICAL	MODERN
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10

71

T
M
B

Naming the Symbols For purposes of identification, let's assign a call number to each of the 63 symbols. This number will be known as the "symbolic value" of the individual ciphers. It should not be confused with the numerical digits in our mathematical code. Permutations of the dots in the left column are evaluated as follows:-

LEFT — RIGHT	
4	32
2	16
1	8

<u>Dot Combination</u>	<u>- Symbolic Value</u>
B	1
M	2
B + M	3
T	4
B + T	5
M + T	6
B + M + T	7

RESEARCH REPORT ON THE EFFECTS OF

The purpose of this study was to determine the effects of the treatment on the subjects. The results of the study are as follows: The treatment had a significant effect on the subjects. The subjects who received the treatment showed a significant improvement in their condition. The treatment was found to be effective in treating the condition. The results of the study are as follows: The treatment had a significant effect on the subjects. The subjects who received the treatment showed a significant improvement in their condition. The treatment was found to be effective in treating the condition.

The results of the study are as follows: The treatment had a significant effect on the subjects. The subjects who received the treatment showed a significant improvement in their condition. The treatment was found to be effective in treating the condition. The results of the study are as follows: The treatment had a significant effect on the subjects. The subjects who received the treatment showed a significant improvement in their condition. The treatment was found to be effective in treating the condition.



The results of the study are as follows: The treatment had a significant effect on the subjects. The subjects who received the treatment showed a significant improvement in their condition. The treatment was found to be effective in treating the condition. The results of the study are as follows: The treatment had a significant effect on the subjects. The subjects who received the treatment showed a significant improvement in their condition. The treatment was found to be effective in treating the condition.

Not Recommended		Recommended	
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40
41	42	43	44
45	46	47	48
49	50	51	52
53	54	55	56
57	58	59	60
61	62	63	64
65	66	67	68
69	70	71	72
73	74	75	76
77	78	79	80
81	82	83	84
85	86	87	88
89	90	91	92
93	94	95	96
97	98	99	100



Figure 1

8

The "symbolic value" of the formations involving the right column may be determined by continuing the sequence with the bottom dot equal to 8. It should be noted that each of the dots in the right column has a symbolic value which is 8 times that of the same dot in the left column.

To obtain the "call number" or "number-name" of any of the 63 braille characters, simply add together the dot values in both columns. (It is by no means necessary to remember these identification labels).

Diagram demonstrating the adaptability of the braille symbols to horizontal and vertical symmetry

0	1	2	3	4	5	6	7
8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31
32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47
48	49	50	51	52	53	54	55
56	57	58	59	60	61	62	63

EIGHT-LINE SYMMETRY PATTERN

Numbers in the diagram indicate the "symbolic value" of the individual ciphers. For consecutive order of the dot-combinations, read across, from left to right, beginning with the top line. The left column contains those symbols numbered in multiples of 8. Braille cells composed of an equal row

The "symbolic value" of the formation involving the
 right column may be determined by continuing the sequence
 with the bottom dot equal to 8. It should be noted that
 each of the dots in the right column has a symbolic value
 which is 8 times that of the same dot in the left column.
 To obtain the "left number" or "number-name" of any of
 the 63 Braille characters, simply add together the dot val-
 ues in both columns. (It is by no means necessary to re-
 member these identification labels).

Diagram demonstrating the adaptability of the Braille
 symbols to horizontal and vertical symmetry

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17																																														

PUNCTUATION SIGNS - - - The following suggestions are offered by the composer of this system as guides in establishing a punctuation code:

Affirmative sentences ought to open and close with the same symbol. At the beginning of a sentence, it is interpreted as a capital sign; at the close of a statement, it is the period.

An exclamatory phrase opens with the same symbol as does an affirmative phrase, but closes with the symbol for phonetic wh.

Questions begin and terminate with an identical symbol. This has many advantages. It is simple for a transcriber to remember that in typing braille-written questions, the ?-symbol at the beginning of a phrase stands for a capital letter. In Spanish, it would signify both a question-mark and a capital letter.

As in typewriting, we make no distinction between opening and closing quotation marks.

When the symbol for single quotation is used in mathematics, it represents the "equal" sign.

If the hyphen symbol appears at the beginning of a braille line, it indicates a poetic passage. A double hyphen is equivalent to a dash. Three successive hyphens symbolize an ellipsis.

In our orthographic system, the apostrophe is the same as the schwa-symbol in the phonetic code and the comma in mathematics.

In phonetics, neither a capital nor an apostrophe are needed.

*** There remain many unused symbols (mostly the 2-dot combinations) which can be given other designations in the punctuation system of our orthographic code. ***

Basic punctuation symbols :

In the accompanying chart, an asterisk (*) indicates a braille dot, and s-v means "symbolic value" :-

s-v 18	54	43	45	47	61	63
**	**	*	**	**	**	**
	**	*	**	*	*	**
		**	**	**	**	**
hyphen	single quo- tation	pho- netic sign	comma	?	affirm. start & stop	"

The following table shows the results of the experiments conducted on the effect of the concentration of the solution on the rate of reaction.

The results show that the rate of reaction increases with the concentration of the solution. This is due to the fact that a higher concentration of the solution means a higher number of particles per unit volume, which increases the frequency of collisions between the particles. As the frequency of collisions increases, the rate of reaction also increases.

It is also observed that the rate of reaction is directly proportional to the concentration of the solution. This can be expressed mathematically as follows:

Rate of reaction \propto Concentration of the solution

The above relationship can be used to predict the rate of reaction for a given concentration of the solution.

The following table shows the predicted rate of reaction for different concentrations of the solution.

Concentration of the solution (M)	Rate of reaction (mol/l.s)
0.1	0.01
0.2	0.02
0.3	0.03
0.4	0.04
0.5	0.05

HENRY'S PROPOSED CODE - - - Consult the diagram on page 8 for dot-combinations.

In the chart which follows, s-v stands for "symbolic value";
 Orth. " " alphabetic letter;
 Num. " " numerical digit;
 IPA " " phonetic value in International Phonetics Association ciphers;
 Punct. stands for punctuation sign.

s-v	Orth.	Num.	IPA	Punct.	s-v	Orth.	Num.	IPA	Punct.
0	.	.	.	space	32	.	.	.	.
1	A	.	.	.	33	.	.	.	.
2	E	.	e	.	34	.	.	.	.
3	.	.	æ	.	35	G	.	g	.
4	I	.	i	decimal point	36	.	.	l	.
5	.	.	ai	.	37	D	.	d	.
6	.	.	ei	.	38	B	.	b	.
7	R	.	r	.	39	J	.	.	.
8	O	.	o	.	40	.	.	.	.
9	.	0	.	.	41	.	8	.	.
10	.	.	œ	.	42	L	.	l	.
11	.	4	.	.	43	.	.	.	phonetic sign
12	.	.	si	.	44	T	.	t	.
13	.	2	.	.	45	.	.	.	comma
14	W	.	w	.	46	.	.	.	.
15	.	6	.	.	47	Q	.	.	question mark
16	U	.	u	.	48	.	.	u	.
17	.	.	ai	.	49	.	.	^	exclamation
18	.	.	.	hyphen	50	H	.	h	.
19	.	.	ij	.	51	F	.	f	.
20	.	.	Y	.	52	P	.	p	.
21	N	.	n	.	53	.	.	.	.
22	M	.	m	.	54	.	.	.	single quotation mark
23	Z	.	z	.	55	.	.	.	.
24	.	.	ou	.	56	Y	.	j	.
25	.	1	.	.	57	.	9	.	.
26	X	.	x	.	58	S	.	s	.
27	.	5	.	.	59	C	.	ts	.
28	K	.	k	.	60	.	.	.	.
29	.	3	.	.	61	.	.	.	capital and period
30	V	.	v	.	62	.	.	.	.
31	.	7	.	.	63	.	.	.	Double quotation

Point, stands for phonetic value.
 station cipher:
 International Phonetic Assoc-
 IFA " phonetic value in
 " " numerical digit;
 " " alphabetic letter;
 a-v stands for "symbolic value".

Page	Line	Word	Page	Line	Word
1	1	the	1	1	the
1	2	of	1	2	of
1	3	the	1	3	the
1	4	of	1	4	of
1	5	the	1	5	the
1	6	of	1	6	of
1	7	the	1	7	the
1	8	of	1	8	of
1	9	the	1	9	the
1	10	of	1	10	of
1	11	the	1	11	the
1	12	of	1	12	of
1	13	the	1	13	the
1	14	of	1	14	of
1	15	the	1	15	the
1	16	of	1	16	of
1	17	the	1	17	the
1	18	of	1	18	of
1	19	the	1	19	the
1	20	of	1	20	of
1	21	the	1	21	the
1	22	of	1	22	of
1	23	the	1	23	the
1	24	of	1	24	of
1	25	the	1	25	the
1	26	of	1	26	of
1	27	the	1	27	the
1	28	of	1	28	of
1	29	the	1	29	the
1	30	of	1	30	of
1	31	the	1	31	the
1	32	of	1	32	of
1	33	the	1	33	the
1	34	of	1	34	of
1	35	the	1	35	the
1	36	of	1	36	of
1	37	the	1	37	the
1	38	of	1	38	of
1	39	the	1	39	the
1	40	of	1	40	of
1	41	the	1	41	the
1	42	of	1	42	of
1	43	the	1	43	the
1	44	of	1	44	of
1	45	the	1	45	the
1	46	of	1	46	of
1	47	the	1	47	the
1	48	of	1	48	of
1	49	the	1	49	the
1	50	of	1	50	of
1	51	the	1	51	the
1	52	of	1	52	of
1	53	the	1	53	the
1	54	of	1	54	of
1	55	the	1	55	the
1	56	of	1	56	of
1	57	the	1	57	the
1	58	of	1	58	of
1	59	the	1	59	the
1	60	of	1	60	of
1	61	the	1	61	the
1	62	of	1	62	of
1	63	the	1	63	the
1	64	of	1	64	of
1	65	the	1	65	the
1	66	of	1	66	of
1	67	the	1	67	the
1	68	of	1	68	of
1	69	the	1	69	the
1	70	of	1	70	of
1	71	the	1	71	the
1	72	of	1	72	of
1	73	the	1	73	the
1	74	of	1	74	of
1	75	the	1	75	the
1	76	of	1	76	of
1	77	the	1	77	the
1	78	of	1	78	of
1	79	the	1	79	the
1	80		1	80	

BIBLIOGRAPHY - - After preparing the foregoing material, I was reluctant to release it until I could make a thorough check on earlier attempts to clarify the code, to minimize the hazards, to eliminate the static, in the braille system of communication. I found the following material especially helpful:-

- 1932 - W. Percy Merrick & W. Potthoff : A Braille Notation of the International Phonetic Alphabet.
 - 1934 - Harry Best : Use of Raised Print by the Blind. This the 36th chapter of his book, Blindness and the Blind.
 - 1936 - Madeleine Seymour Loomis : Sequence and Syllabication.
 - 1947 - John Sargent : Report of the Expert Committee of the Central Advisory Board of Education on Uniform Indian Braille.
 - 1948 - P. M. Advani : Braille - What it is and How it has been used.
 - 1949 - Sir Clutha Mackenzie's Report on the World Braille Situation - prepared at the request of UNESCO.
 - 1950 to 1953 - All articles on braille problems in these volumes of: International Journal for the Education of the Blind; The New Beacon; and Outlook for the Blind.
 - 1953 - Abraham Nemeth : Nemeth Code of Braille Mathematics.
 - 1953 - F. W. MacKenzie : Braille Printing and the Periprinter. This article in the Primrose Annual (1953) describes the new electronic "sensing machine" now in use for printing "solid dot braille" in plastic ink on both sides of tissue-thin paper. It mentions former embossing systems.
- *****

For the gracious assistance in obtaining these and several other references I am grateful to the Librarians at the following addresses in New York city :-

- American Foundation for the Blind;
 - The Jewish Braille Institute of America;
 - The Library for the Blind (a branch of the N Y Public Library);
 - The New York Institute for the Education of the Blind;
 - United Nations Library.
- *****

NOTICE TO PUBLISHERS : The author of this report has the sole copyright over publication of word lists based on the sequence of the phonetic symbols as they appear in this coding system.

--A.H.

100-443887-1000

1. The first part of the document is a list of names and titles, including "The Hon. Mr. Justice" and "The Hon. Mr. Justice".

... ..

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

10-11-68

1. The first part of the document is a list of names and dates, which appears to be a roster or a list of individuals. The names are written in a cursive script, and the dates are written in a more formal, printed style. The list is organized into two columns, with names on the left and dates on the right.

1. The first step in the process of the investigation is the identification of the problem. This is done by the investigator who is responsible for the study. The investigator must first identify the problem that is being investigated. This is done by the investigator who is responsible for the study. The investigator must first identify the problem that is being investigated.

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1. The first of these is the fact that the majority of the population of the United States is now living in urban areas. This is a result of the process of urbanization, which has been going on since the beginning of the 20th century. The population of the United States has increased from about 100 million in 1900 to over 200 million in 1950. At the same time, the population of rural areas has decreased from about 100 million in 1900 to about 50 million in 1950. This has led to a concentration of the population in urban areas, which has had a number of important consequences. One of the most important is that it has led to a change in the way of life of the majority of the population. In rural areas, the population has traditionally been engaged in agriculture, and the way of life has been based on the needs of the farm. In urban areas, the population has traditionally been engaged in industry and commerce, and the way of life has been based on the needs of the city. This has led to a number of differences between the two ways of life, including differences in the types of housing, the types of food, and the types of entertainment. These differences have led to a number of problems, including the problem of housing, the problem of food, and the problem of entertainment. These problems have led to a number of social and economic changes, including the development of the welfare state, the development of the consumer society, and the development of the modern city. These changes have led to a number of important consequences, including the development of the modern world as we know it today.

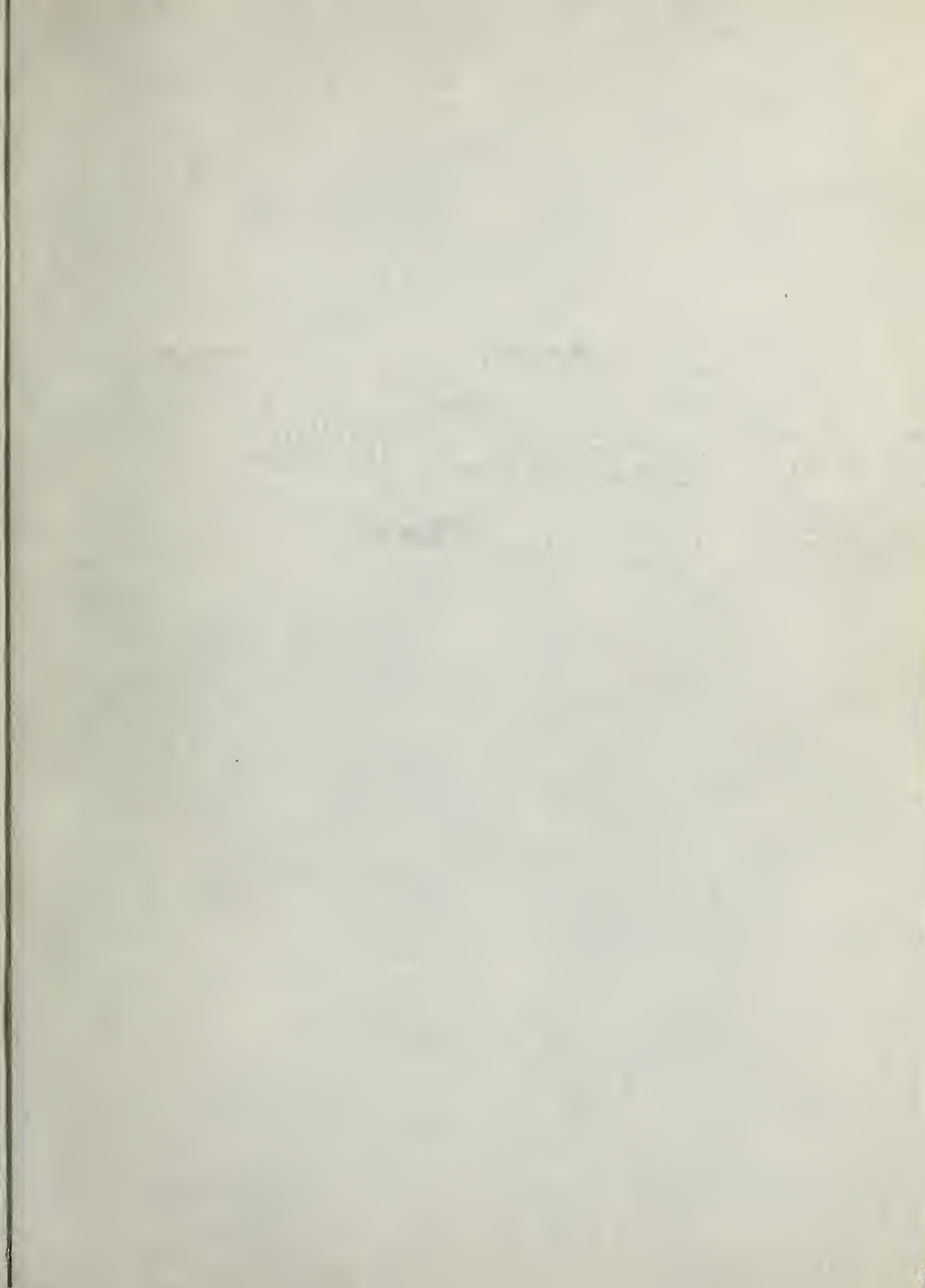
10-1-1968

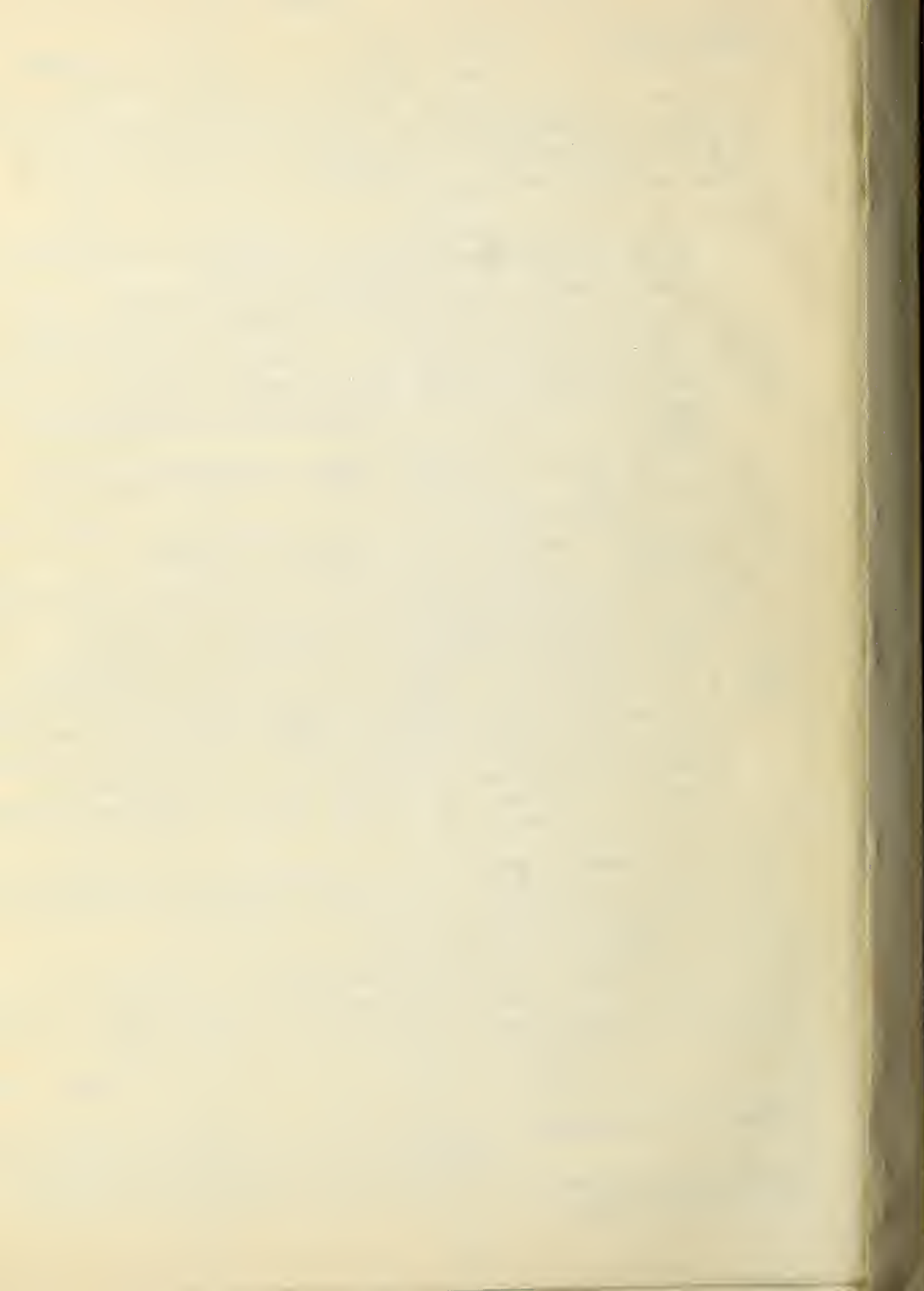
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$\frac{1}{2} \left(\frac{1}{2} \right) = \frac{1}{4}$





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